SUPPLEMENTARY INFORMATION

Isotropic - nematic phase transition of polydisperse clay rods

Phillip Woolston and Jeroen S. van Duijneveldt

STANDARD DEVIATION IN ASPECT RATIO

As the length and diameter are independent Eq. 1 can be used to calculate the standard deviation in the aspect ratio.

$$\sigma_{L^*/D^*} = \left(\frac{\langle L^*\rangle}{\langle D^*\rangle}\right) \times \left[\left(\frac{\sigma_{L^*}}{\langle L^*\rangle}\right)^2 + \left(\frac{\sigma_{D^*}}{\langle D^*\rangle}\right)^2\right]^{1/2} \tag{1}$$

The standard deviation in the average ⟨L*/D*⟩ then follows from Eq. 2, where N is the number of particles counted in analysing the TEM images.

$$\sigma_{\langle L^*/D^*\rangle} = \frac{\sigma_{L^*/D^*}}{\sqrt{N}} \tag{2}$$

PHASE DIAGRAM - ERROR ANALYSIS

As the value of ϕ_I/ϕ_N is taken from extrapolations of the linear trend line for the nematic fraction as a function of rod volume fraction it is possible to rewrite this in terms of the gradient and intercept of the trend lines as seen in Equations 3 to 5 where a is the intercept of the line and b is the gradient, listed in Table I. This allows evaluating the standard deviation in these parameters.

$$0 = a + b\phi_I \text{ and } 1 = \mathrm{a} + \mathrm{b}\phi_\mathrm{N} \tag{3}$$

which rearranges to

$$\phi_I = \frac{-a}{b}, \phi_N = \frac{1-a}{b} \tag{4}$$

so

$$\frac{\phi_I}{\phi_N} = \frac{\frac{-a}{b}}{\frac{1-a}{b}} = \frac{-a}{1-a} \tag{5}$$

The standard deviation of ϕ_I/ϕ_N then follows as

$$\sigma_{\frac{\phi_I}{\phi_N}} = \sigma_a \times \left| \frac{\partial \frac{\phi_I}{\phi_N}}{\partial a} \right| \tag{6}$$

$$\sigma_{\frac{\phi_I}{\phi_N}} = \left| \frac{(-1) \times (1-a) - (-a) \times (-1)}{(1-a)^2} \right| \times \sigma_a = \left| \frac{a-1-a}{(1-a)^2} \right| \times \sigma_a = \frac{\sigma_a}{(1-a)^2} \tag{7}$$

REFERENCES

[1] N. Yasarawan and J. S. van Duijneveldt, *Langmuir*, 2008, **24**, 7184–92.

[2] Z. X. Zhang and J. S. van Duijneveldt, *The Journal of Chemical Physics*, 2006, **124**, 154910.

[3] P. A. Buining and H. N. W. Lekkerkerker, *The Journal of Chemical Physics*, 1993, **97**, 11510–11516.

[4] M. P. B. van Bruggen, J. K. G. Dhont and H. N. W. Lekkerkerker, *Macromolecules*, 1999, **32**, 2256–2264.

TABLE I. Data obtained by linear regression applied to the nematic fraction as a function of the core volume fraction.

	Clay	b	σ_b	a	σ_a	$\langle D^*/L^* \rangle$	c_{50}	RSD	Φ_I/Φ_N
Ref. 1	S9	10.99	0.63	-0.138	0.037	0.035	2.75	0.419	0.121
Ref. 1	S9	10.04	0.75	-0.225	0.053	0.046	2.69	0.428	0.184
Ref. 1	S9	6.57	0.15	-0.217	0.018	0.087	2.10	0.397	0.178
Ref. 2	B20	8.92	0.39	-0.534	0.042	0.043	3.17	0.398	0.348
Ref. 2	B20	11.68	0.59	-0.496	0.05	0.032	3.06	0.306	0.332
2	B20	8.4	0.3	-0.704	0.043	0.061	2.57	0.244	0.413
1	B20	8.9	0.8	-0.105	0.049	0.057	2.36	0.547	0.095
2	B20	8.61	0.54	-0.093	0.039	0.060	2.34	0.642	0.085
3	B20	8.97	0.65	-0.162	0.037	0.058	2.46	0.631	0.139
4	B20	10.95	1.56	-0.154	0.075	0.048	2.52	0.632	0.133
5	B20	9.22	0.36	-0.078	0.015	0.050	2.65	0.622	0.072
6	B20	13.34	1.58	-0.335	0.099	0.048	2.63	0.570	0.251
7	B20	18.62	0.41	-0.278	0.011	0.054	1.65	0.630	0.218
Ref. 3	Boehmite	-	-	-	-	0.101	2.91	0.469	0.297
Ref. 4	Boehmite	-	-	-	-	0.071	2.73	0.261	0.345